

END TERM EXAMINATION

SECOND SEMESTER [BCA] MAY-JUNE 2016

Paper Code: BCA-102

Subject: Mathematics-II

Time: 3 Hours

Maximum Marks: 75

Note: Attempt any five questions including Q.no.1 which is compulsory.
Select one question from each Unit.

- Q1 (a) Show that the relation ' \leq ' is partial order relation on the set of natural numbers. (Where ' \leq ' means less than or equal to). (3)
- (b) Show that $(A \cup B)^c = A^c \cap B^c$. (3)
- (c) Find the domain and range of the function $f(x) = 1/\sqrt{x-2}$. (3)
- (d) Define Tautology and Contradiction. (3)
- (e) By means of truth table, prove that $\sim(p \leftrightarrow q) \equiv \sim p \leftrightarrow q \equiv p \leftrightarrow \sim q$. (3)
- (f) If $f(x) = x^3$, then find f^{-1} for all $x \in R$. (3)
- (g) Verify De-morgan's laws for universal set $U = \{1, 2, 3, 4, 5, 6, 7\}$, $A = \{4, 1, 2, 5\}$ and $B = \{1, 2, 4, 6\}$. (3)
- (h) Define Distributed & Complemented Lattice. (2)
- (i) Define POSET with example. (2)

Unit-I

- Q2 (a) If R is an equivalence relation in a set A, then prove that R^{-1} is also an equivalence relation. (6)
- (b) Let $U = \{a, b, c, d, e\}$, $A = \{a, b, d\}$ and $B = \{b, d, e\}$. Find (i) $A \cup B$, (ii) $B \cap A$, (iii) $B - A$ (iv) $A^c \cap B$ (v) $B^c - A^c$. (6.5)
- Q3 (a) Let $f: R \rightarrow R$ be defined by (6)
- $$f(x) = \begin{cases} 3x + 2; & x > 0 \\ 2x + 3; & x \leq 0 \end{cases}$$
- then find $f^{-1}(0), f^{-1}(1), f^{-1}(-3)$.
- (b) Define the relation "congruence modulo m." Show that it is an equivalence relation in set of integers. (6.5)

Unit-II

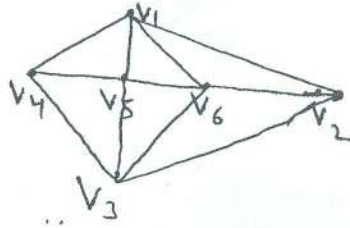
- Q4 (a) Let (L, \leq) be a lattice, then prove that for every element $a, b \in L$, (6)
- (i) $a \vee b = b$ iff $a \leq b$
- (ii) $a \wedge b = a$ iff $a \leq b$
- (iii) $a \wedge b = a$ iff $a \vee b = b$
- (b) Prove that every finite lattice L is bounded. (6.5)
- Q5 (a) Find the complements of each element in D_{42} . (6)
- (b) Let R be the relation of divisibility on set A. Draw the Hasse diagram of poset relation R where $A = \{2, 4, 8, 16, 32\}$. (6.5)

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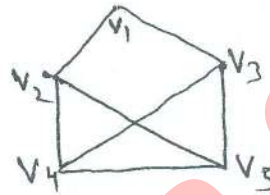
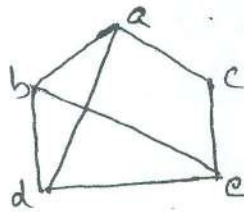
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Unit-III

- Q6 (a) Find the chromatic number of the graph given below using the Welch-Powell algorithm. (6)



- (b) Show that the graphs are isomorphic. (6.5)



- Q7 (a) Draw a 3-regular graph with 6 vertices. (6)
 (b) Prove that the degree of any vertex in a simple graph of n vertices cannot exceed $n - 1$. (6.5)

Unit-IV

- Q8 (a) Prove that $(p \rightarrow q) \Leftrightarrow (\sim q \rightarrow \sim p)$ is a tautology. (6)
 (b) Show that $p \leftrightarrow q$ logically implies $p \rightarrow q$. (6.5)
- Q9 (a) Prove that $p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$. (6)
 (b) Prove that $p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$. (6.5)

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